

## Acoustic Rapid Commercial Off-the-Shelf (COTS) Insertion for SONAR AN/BQQ-10 (V) (A-RCI)

### Executive Summary

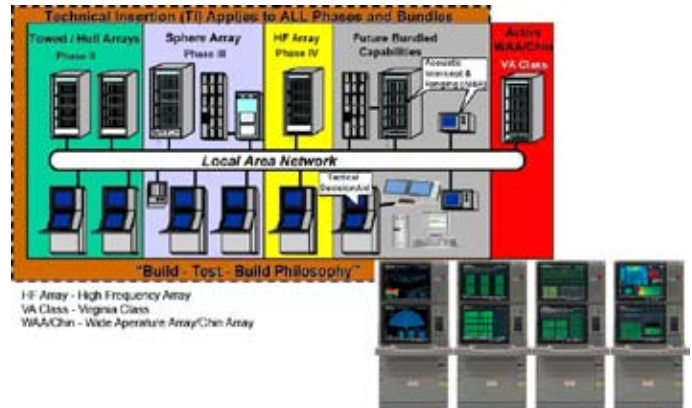
- The Navy completed follow-on operational test and evaluation (FOT&E) of Acoustic Rapid Commercial Off-the-Shelf (COTS) Insertion (A-RCI) Advanced Processor Build (APB)-03 sonar in September 2006. The APB-03 system demonstrated some performance improvements over the APB-00 baseline system, but failed to meet performance thresholds against diesel submarines and for mine detection and avoidance. Also A-RCI remained unsuitable due to software reliability and maintainability, training, tactics, documentation, and auxiliary equipment shortfalls.
- The Navy continues to field new A-RCI variant sonars on submarines before conducting operational testing.
- The Navy does not have an effective process for operational evaluation of these new systems before they are fielded and deployed.

### System

- A-RCI is an open architecture sonar system designed to maintain the acoustic advantage over threat submarines.
- A-RCI utilizes legacy sensors and replaces central processors with COTS computer technology and software. It includes:
  - A sonar system for the *Virginia* class submarine
  - A replacement sonar system backfit into *Los Angeles*, *Trident*, and *Seawolf* class submarines
  - Schedule-driven annual software upgrades (APBs) and biannual hardware upgrades (Technology Insertions)
- Improvements are intended to provide expanded capabilities for anti-submarine warfare and mine warfare, particularly in littoral waters and against diesel submarines.

### Activity

- In January 2006, the Navy conducted dedicated FOT&E to evaluate A-RCI performance against diesel submarines.
- In March 2006, the Navy conducted FOT&E of the high-frequency Mine Sonar to determine if the APB-03 variant corrected deficiencies identified in the FY03 operational test of the APB-00 high-frequency Mine Sonar.
- The Navy continues to field A-RCI systems on operational submarines. By October 2006, the Navy was installing eight A-RCI APB-04 systems and started installing A-RCI APB-05.
- Neither the requirements document nor the draft Test and Evaluation Master Plan (TEMP) for APB04/APB05 have been approved by the Navy.
- In September 2006, Commander, Operational Test and Evaluation Force (COMOPTEVFOR) issued a combined



### Mission

Submarine crews equipped with the A-RCI sonar can complete the following submarine force missions:

- Search, detect, and track submarine and surface vessels in open-ocean or littoral sea environments without being counter-detected
- Search, detect, and avoid mines or other submerged objects either on the ocean bottom or in the water volume
- Covertly collect acoustic Intelligence Surveillance/Reconnaissance information
- Covertly conduct Special Forces Operations missions
- Conduct under-ice operations

operational test report evaluating all completed testing on A-RCI APB-03 and prior systems.

- Test and evaluation and Navy testers continue to participate in at-sea fleet exercises and laboratory testing in an attempt to obtain insights into A-RCI system performance.
- Operational testing of A-RCI APB-04 is scheduled to start in 1QFY07. This testing will include arctic operations, which have not been tested to date and end-to-end testing of the *Trident* SSGN class submarine system.

### Assessment

- The Navy completed operational testing of A-RCI APB-03 and prior variants for *Los Angeles* class submarines. Test completion was possible because the submarine force

committed dedicated assets to complete the evaluation. The Navy's efforts to combine A-RCI operational testing with other fleet activities resulted in inadequate testing and increased the test time to resolve effectiveness and suitability issues. Too often, test objectives were lower priority or conflicted with exercise and training objectives.

- The Navy successfully avoids system hardware obsolescence through the use of technical insertions. Also, the use of commercial equipment simplifies the logistics tail and allows for regular system upgrades as processing power and other improvements are developed by the commercial sector.
- COMOPTEVFOR's FOT&E report on A-RCI APB-03 identified several performance parameters that were below threshold and evaluated the system as not effective against diesel submarines or for mine detection and avoidance. The report also determined A-RCI APB-03 as not suitable due to continued software reliability, training, tactics, and documentation deficiencies. DOT&E agrees with this assessment. Although A-RCI is an improvement over the legacy sonar systems, no sufficient test data exists to suggest that A-RCI improves capability between APBs. Navy post-test data analysis does indicate the targets signals were present. DOT&E assesses the operator was not provided the tools or training to better his detection performance. Suitability areas

related to crew training, tactics, documentations, and software reliability have not improved and contributed to the not effective rating.

- Operational testing of the A-RCI mine detection and avoidance system demonstrated poor system performance against some mine types and identified the lack of an adequate testing and training minefield.
- Lack of submarine test assets, poor system reliability, and a low priority on operational testing continues to prevent adequate evaluation of A-RCI upgrades.

## Recommendations

- Status of Previous Recommendations. The Navy is taking effective action on two of the four FY05 recommendations. The following FY05 recommendations remain valid:  
FY05 #1: The Navy should develop event-based A-RCI spirals vice annual spirals.  
FY05 #4: The Navy should develop appropriate platform-level requirements and performance metrics with thresholds and accomplish end-to-end testing for A-RCI upgrades.
- FY06 Recommendation.
  1. The Navy should develop, produce, and maintain a representative testing and training minefield.